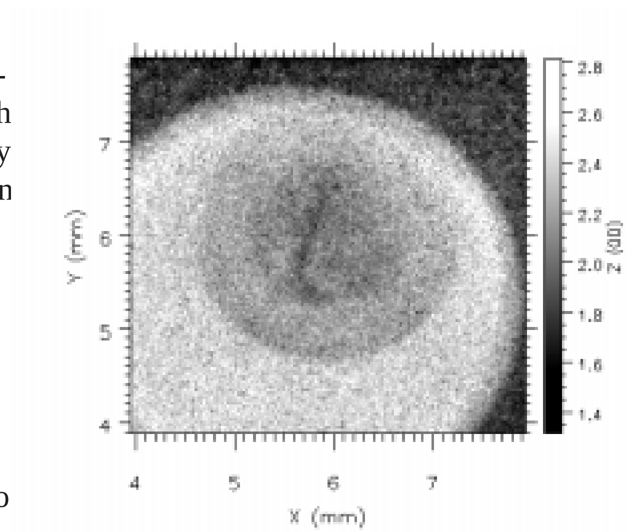
Los Alamos
Inertial Confinement Fusion

September 1998 Progress Report
LALP-98-69

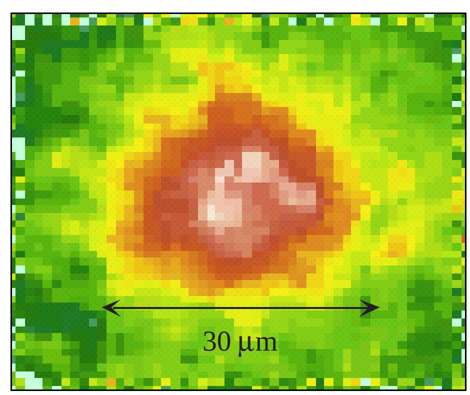
Double-Shell Implosions:

The double shell implosions done at Omega in September 1998 consisted of an inner glass micro-balloon (106 µm inside radius) filled with 36 atm of either DT or DD, surrounded by a foam region 69 µm thick and a outer solid CH shell 77 µm thick. The foam and outer solid CH shells were made from machined hemispheres glued together. These shots constituted a first attempt at Omega, using the predicted better time dependent symmetry in a tetrahedral hohlraum, to study a potential non-cryogenic, high convergence NIF point design (CR ~ 38). The primary diagnostics on the shots (3 DT and 2 DD) were neutron yield, bangtime, and burn history. An effort to use the Medusa array to monitor ion temperature and ρR produced no results due to the low yield. Neutron yield was low on all shots, ranging from 0.5-1.5% of calculated clean, based on a 30 kJ incident energy in the calculations, with 2 kJ assumed backscattered so that 28 kJ drove the target. This 1-2% yield-over-clean calculated (YOC) result is essentially identical to earlier attempts to use a double shell design at Nova, and suggest that the drive asymmetry differences between cylindrical and tetrahedral hohlraums, and the different beam energy balance in the two facilities, is not the limiting factor in the poor implosion behavior. An auxiliary diagnostic, backlit imaging of the capsule at early time utilizing the Au hohlraum wall emission, proved very useful, showing evidence of both apparent azimuthal surface perturbations by about 700 ps, and of a perturbation possibly associated with the joint between the hemispheres, on some shots. This imaging data may provide information useful in improving future double shell implosions.



High-Convergence Implosions:

We recently initiated a campaign at the Omega Laser Facility to study high-convergence implosions driven by an x-ray field symmetry of a quality closely comparable to that of NIF cylindrical hohlraums. The high-quality Omega drive was obtained using tetrahedral hohlraums illuminated with all 60 beams, and the preliminary results suggest the yield-over-clean calculated (YOC) versus calculated convergence ratio (η) are only slightly improved compared to Nova results. With a continuation of Omega experiments during FY99, we hope to resolve important questions that have been raised regarding the source of yield degradation in high convergence implosions.



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